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# SCIENCE NEWS-LETTER

*The Weekly Summary of Current Science*

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## AS RARE AS HE IS UGLY

*The Kivu Gorilla, Never Seen Alive in Any Zoo*

(See page 11)

Vol. XV No. 405

# Hourly Reports for Safe Air Travel

*Aviation*

Hourly reports of weather along the airways are one of the needs of civil aeronautics. In this way the pilots may be immediately informed of any changes in weather conditions, Willis R. Gregg of the United States Weather Bureau recently told members of the American Meteorological Society.

"At the present time the established airways cover some 14,000 miles, with about half this distance lighted for night flying.

"Special weather service has been organized on all of these airways. This service includes upper air reports from about 50 stations at which pilot balloons are used in measuring upper winds, and reports of surface weather conditions from about 150 stations, located at critical points on the airways themselves. In general the reports are timed to fit the flight schedules, although there are now in operation two experimental services—San Francisco to Los Angeles and New York to Cleveland—in which the reports are furnished at frequent, regular intervals, both day and night. Thus *all* flying on those airways is served, whether on regular schedule or not.

"The reports contain information concerning those weather elements that are of most concern to pilots, particularly visibility, ceiling (height of cloud base), fog and storminess. These reports are supplemented by short-range forecasts for the next one to five or six hours.

"So much for the present status. As to the future prospects, the plans that are being worked out for adoption as rapidly as facilities permit include the following:

"a. The extension of the twice-daily program of country-wide reports to a four-times-a-day program, thus making available general forecasts and bulletins at intervals of six hours instead of twelve hours, as at present.

"b. A suppplementary system of three-hourly reports from small areas, 'secondary nets,' along the several airways. The receipt of these by trained meteorologists at airport stations will make possible the safeguarding of fliers from disturbances that develop some distance off the airways and approach them from one side or the other.

"c. Hourly reports from numerous points on the airways themselves. These will keep the meteorologists and others constantly informed as to changes that may be occurring along the line of flight.

"d. A prompt and dependable system of communications is the 'backbone' of the service. At present the teletype, or typewriter-printer, is being favorably considered for the hourly reports. Probably the telegraph and telephone will answer for the less frequent reports. Radio must be included for communications between ground and plane and will supplement the others when they are out of commission."

*Science News-Letter, January 12, 1929*

## Quake Predictions Guessed

*Radiovision*

Recent predictions of severe earthquakes in the Balkans and the Andes, beginning on December 27 and culminating on December 29, as announced by Rafael Bendandi, an Italian, failed completely, thus emphasizing anew that earthquake predictions at present are only guesses, says L. Don Leet, observer at the Harvard seismograph station.

"As usual, there was no sign of the predicted 'strong disturbances' in spite of the generous area of seismically active territory named," said Mr. Leet. "Such incidents, however, have been repeated from time to time during past years because Mr. Bendani's many failures are ignored, and anything that can be construed as a successful forecast is given prominence.

"The 'prediction' of earthquakes for a definite hour, day, or even year, at the present stage of the science of seismology can be nothing but a guess. Certain guesses have greater probability than others, but they are guesses none the less.

"Bendandi's 'predictions,' moreover, cannot be regarded merely as unscientific but harmless fakes. They are reprehensible to a high degree when one considers the effect upon credulous people in the regions affected."

*Science News-Letter, January 12, 1929*

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All of the resources of Science Service, with its staff of scientific writers and correspondents in centers of research throughout the world, are utilized in the editing of this magazine.

# Interesting Animals Never Seen in Zoos

*Zoology*

*THE DUCK-BILLED PLATYPUS, known to zoologists as Ornithorhynchus anatinus, is peculiar because it lays eggs but suckles its young. A native of Australia, all attempts to bring one to America in captivity have been vain, though a specimen of its close relative, the echidna, has survived for many years in the Philadelphia zoological garden*

By William M. Mann

**Dr. Mann is director of the National Zoological Park in Washington.**

Some of the world's most interesting animals never have been seen in the United States. Others appear in American exhibits so infrequently that they are known to the general public only from stuffed specimens in museums or pictures in zoology textbooks.

No zoo can hope to present a complete collection of the animals of the globe. The great and inevitable gaps are due to a variety of reasons. In the first place, no zoo could hold all the animals, even if provided with all the buildings appealed for annually in the official report. Many creatures can not, or will not, live in captivity. This weakness may be purely physical, as is the case with some of the delicate and beautiful South American monkeys in whom the life processes seem delicately balanced to a specific environment. With others it may be essentially temperamental. Some animals fret themselves to death in captivity. William T. Hornaday long ago formulated zoo ethics in the words, "If an animal will not live happily in captivity, do not keep it in captivity." Beside being humane, this is a thoroughly practical idea, because if an animal will not live happily, it usually will not live at all.

Some creatures are worth, literally, their weight in gold. Zoo directors naturally are loath to pay enormous sums for creatures which are likely to die in a week or two. Any man with a budget to consider will hesitate a long time before signing a check for $5,000 for a baby gorilla whose chances of survival for more than a few months are slim. Yet one gorilla lived for seven years in captivity, another for over three; and at present there are three specimens in the United States—one in the zoo at Philadelphia, one in our Washington zoo and one in the hands of a dealer.

Some animals are so rare that they never come into the hands of dealers—so rare, in fact, that their very existence is open to question. Some have restricted habitats in such out-of-the-way corners of the world that it would be necessary to send special expeditions to obtain them. Still others are highly specialized feeders whose diet cannot be provided for them far from their birthplaces. Some, on the verge of extinction, are so carefully protected by law that permits to capture them are practically unobtainable. A few, it is barely possible, still are unknown to science, although it is extremely doubtful if any animal of major importance remains to be discovered. Within the past ten years trained observers have penetrated to almost every spot on the globe capable of sustaining animal life and any creature of striking interest hardly could have escaped them.

Few Americans ever have seen the duck-billed platypus or the echidna, those curious egg-laying Australian animals which seem like reptiles in the process of becoming warm-blooded but undecided whether to become birds or mammals. They are the greatest curiosities in the mammal world and would be highly prized exhibits in any zoo. But in the first place it is extremely difficult to obtain the platypus. Permits to capture them are issued by the Australian government very infrequently, and never to private individuals. In the second place, they don't live. The one example of platypus that has arrived in the United States was brought in by Ellis Joseph, the great naturalist collector. We had observed the animals in Australia for years and succeeded in bringing one to New York, where it lived for only five weeks. One echidna has lived for years in the Philadelphia zoo, but this is a solitary example of success among many failures. This one is kept on earth and during the daytime it sleeps in the shelter of a wooden box, unseen by visitors; in the evening it comes out and eats its single meal of raw egg and milk. Both the playtpus and the echidna are specialized feeders and have no facility for adapting themselves to a new environment. Better success may be had when more is known of their diet and habits.

*THE SOLENODON is an archaic insectivore from Cuba, and is rarely seen in captivity*

*THE BROWN HYENA, a native of southwest Africa, seldom reaches our zoological parks, though this one is a resident of the National Zoological Park in Washington*

I recently saw a dead proboscis monkey in the store of a dealer in New York City. It had died before reaching the States. This monkey inhabits the island of Borneo and is probably the queerest and quaintest of all the monkey race. Some of the "wild-man-of-Borneo" legends may have been inspired by this animal. Its low forehead is crowned with chestnut locks, neatly parted in the middle. It has bushy chestnut whiskers and beard, so that the white face is framed in masses of long hair. Its cheeks are far apart, it has a wide mouth, and its cheeks and chin are tinged with blue, as if it were in the habit of shaving every morning. But the most remarkable feature of all is its nose. Monkeys as a (*Turn to next page*)

## Strange Animals Never Seen in Zoos—*Continued*

rule have no noses at all. Some of them have muzzles like dogs. Others merely have nostrils opening straight into the face below the eyes. But this animal has a pointed nose, tilting upward at the tip, which is several inches long, reminding one of the trunk of a tapir. Oddest of all is that the nose keeps growing during the life of the owner. The age of a proboscis monkey can be estimated from the length of his nose. Few wild animals appear so "human". When young it has been compared to a mentally defective youth, but when old it reminds one of a crabbed old man of a highly obstinate disposition. The Dyaks declare that it is not a monkey at all but a degenerate human being whose ancestors took to a life in the forests to avoid payment of taxes. A small specimen lived for a short time in the zoo in Amsterdam.

None of the many varieties of bats is seen often in zoos. Despite the somewhat morbid interest which attaches to these creatures, they form uninteresting exhibits. They cannot endure daylight. Fruit bats sometimes can be seen in the monkey houses of zoos by anyone who takes the trouble to lift the thick curtains which shut them off from the light, but they look very much like bunches of dry sticks suspended from horizontal bars. Others of this family are highly specialized creatures which cannot be kept alive in captivity. Among these is the vampire bat of South America which actually does suck human blood. Most interesting of all, perhaps, is the Socirine bat of Central America. Its great peculiarity is that it has a very long, very slender, and very extensible tongue with a brush of reversed bristles at the extremity. Some believe that it can hover in front of over-ripe fruit and lick out the pulp with its tongue. Others say that it feeds on certain insects which it brushes out from flowers with this tongue after the manner of certain humming birds. The fish-eating bat of the Caribbean Sea, an anomalous creature, would be a striking display could it be captured and maintained.

Among our well-known North American animals, the moose is perhaps the rarest of all in collections, this again due to specialized feeding habits. Attempts to keep them in captivity nearly always fail. They are docile creatures with no temperamental weakness, their natural diet can be exactly duplicated, but they do not survive for more than a few months, and zoos hesitate to purchase specimens. Lack of exercise may be the explanation. Likewise, few persons in the East have seen the pronghorned antelope, which now is disappearing rapidly from the western plains. The trouble here is temperamental. It cannot adjust itself to a restricted range. Any of these animals brought into captivity simply brings the species that much nearer extinction because there can be no great expectation of keeping one alive. Yet the pronghorn has on occasion lived for a time in captivity. Zoos have successfully bred it. In the National Zoo at Washington one lived for eight years. During that time it broke its leg. This was put in splints and finally completely healed. This animal was eventually killed by a mule deer which leaped over a fence and horned it.

The bear family has two members, one of which has never been seen in North America, the other seldom. One of them has seldom been seen by anybody anywhere. It is the rarest of all the bruins. This animal, the panda bear or parti-colored bear of Thibet, has been known to science only since 1869. It is a rare animal in an inaccessible habitat. The general color is white, but the eyes are surrounded with black rings, the small ears are black, and the shoulders are marked by a transverse stripe of the same color gradually increasing in width as it approaches the fore-limbs. All four legs are black. Practically nothing is known of its habits, though it is said to feed on bamboo and other vegetables.

Almost equally rare in captivity is the spectacled bear of the Peruvian Andes, the sole representative of the family in South America. It is a small black bear given an extremely grotesque appearance by tawny circles around the eyes. The animal is only about three and one half feet long. The endemic bear of North Japan, the sacred bear to the Ainus, is equally rare.

Widely separated from the elephant in size is its closest relative among living mammals. This is the hyrax, an animal very similar in superficial appearance, size and habits to the rabbit. One species which inhabits Asia Minor is designated in the King James Bible by the word "coney", generally applied to the rabbit. With the exception of this single species the hyraces are confined to the African continent. All are playful, intelligent creatures and are much hunted for their soft skins. Why they do not thrive in captivity in general we do not know. Specimens obtained by the National Zoological Park were apparently contented and in good health, but they dropped off one by one. However, a South African species sometimes lives for a considerable time in captivity.

The greatest prize any zoo could possibly obtain would be a white rhinoceros. This animal is on the verge of extinction but still is met with occasionally in South Africa. One was killed last year by George Eastman. It is the largest of the rhinos. The color actually is a slate-grey, only a shade or so lighter than that of other members of this family. Perhaps its most remarkable character is the length of its front horn. One of these horns preserved in the British Museum has a total length of 56 inches. Others, however, measure less than 40 inches. The rear horn is only about one-third as long.

The white rhino, it is generally agreed, is a harmless, inoffensive creature, very dull-witted and asking only to be let alone. These animals generally travel in pairs or in parties of three, frequenting open, grassy plains, They generally are accompanied by the curious rhinoceros-birds which, by flapping their wings and screeching, often warn their enormous hosts of the approach of danger. The calf always walks in front of the mother and is directed by proddings from her long front horn.

Still another type of rhino not only never has been seen in captivity but has been known to science only a couple of years. As described to the German scientific journal *Die Umschau* by Dr. F. Vageler, it seems like a scaly monster of the pre-human ages of the earth surviving into modern times in the almost unvisited swampy country of southern Java. It is described as a one-horned rhino, related to a form already known elsewhere in the East Indies but differing from it in that its almost naked hide is covered closely with small hard, horny scales. It also has enormous front teeth, like those of a hippopotamus. It has often been described by the natives under the name of "Tanggiling", which means "scaly beast", but Europeans were incredulous, regarding these reports as folk-lore. A few professional hunters among the whites had killed specimens, but they could obtain such (*Turn to next page*)

## Strange Animals—*Cont'd*

high prices from the Chinese, who use the hide and horns of rhinos in medicine, that they were secretive about the business and did not share their knowledge with scientists. Photographs obtained by Dr. Vageler, however, show that the animal is something entirely new to science. No effort has been made, so far as is known, to capture one of these creatures alive.

Java, Sumatra and Borneo, it is possible, may have other interesting animals to offer which are now unknown to science. The natives have some queer legends, and folk-lore quite frequently has a basis in truth. When Dr. Ales Hrdlicka, curator of physical anthropology at the U. S. National Museum, was in Sumatra on the track of ancient man three years ago he was told of a "wild man" who inhabited the jungle fastnesses. Perhaps a rare and odd monkey might have been responsible for these tales.

There is now no specimen in the United States of the wisent, or European bison. This splendid animal, like the North American bison in appearance, was almost wiped out in the world war. At the outbreak of hostilities it was represented by two herds—one in the Caucasus and one in Lithuania. At the beginning of 1914 the two herds numbered about 1500. In 1925 a census showed only 66 of them in Europe—all on private estates or in zoological gardens. A society has been formed for their preservation.

But if one peruses the list of animals that have lived at one time or another in the great zoological garden of London, he will find as far as the mammalia are concerned a most wonderful array of animals named. Certainly few mammals that the layman could name have not been exhibited at some time or other. The pangolin, heavily scaled and almost impossible to keep alive, has been exhibited on numerous occasions. The fossa cat from Madagascar, the aard-vark, the takin, the bandicoot, the pouched Tasmanian wolf, have all been seen there by the public. Each year brings animals new to collections into captivity. The bongo, a wonderful red and white antelope of West Africa, until recently stood preeminent among the list of animals never seen in captivity, but one is now in the zoo at Paris. The nyala is living in Washington, and both St. Louis and San Diego have captive sea elephants.

At the present time many well-known large and (*Turn to next page*)

# Prize Research May Help Sufferers

*Medicine*

Out of the research that won the $1,000 prize of the New York meeting of the American Association for the Advancement of Science, just closed, there may come new treatments for severely burned fire victims, water-logged fat people, and sufferers from diabetes insipidus.

Dr. Oliver Kamm, the research director of the Detroit drug manufacturers, Parke, Davis and Company, who was honored for his paper on "Hormones from the Pituitary Gland," has studied for the past few years one of the smallest and most important organs of the human body.

About the size of a green pea, the pituitary gland is located near the brain, carefully protected and inaccessible. The front or anterior portion of the gland is responsible, when it is overactive, for some giants of the circus and other ungainly, unfortunate individuals whose skeletons have grown abnormally.

Dr. Kamm investigated the back or posterior lobe of the gland, and found two hormones, called alpha and beta, produced by it.

If you could buy these hormones, they would cost you millions of dollars a pound. As it is, Dr. Kamm has been able to produce only a very few fractions of an ounce. So limited is the quantity that the chemical analysis must be performed under the microscope and the pituitary glands of 50,000 cattle must be used to obtain enough hormones for a single laboratory experiment.

The alpha hormone promises the women of the world some relief from the pains of childbirth, as it aids that process. At present its cost price, at the rate of $3,000,000 a pound, prevents practical use.

The beta hormone has the important function of controlling the utilization of water in the tissues of the body. Dr. Kamm has been able to classify individuals as "physiologically wet" or "physiologically dry."

"Some individuals, the physiological wets, are (*Turn to next page*)

## X-Ray Evolution Study

*Biology*

Money in excess of $25,000, a loan of $40,000 worth of radium, together with other facilities are now available for studies on the effects of X-rays, radium rays and other forms of radiation on living organisms. Announcement to this effect has just been made by a special committee of the National Research Council, headed by Dr. W. C. Curtis of the University of Missouri, through the agency of Science Service. The committee desires that qualified research workers who have problems in hand falling within the scope of the present program should get in touch immediately with the Division of Biology and Agriculture, National Research Council, 21st and B streets, Washington, D. C.

The funds now available, the committee states, are only the results of the first canvass of the field of possible donors; more may be expected later. The whole period provided for will extend over five years. It is expected that the applicants who qualify will be connected with universities or research institutions, which will continue to pay their salaries, and will also provide general laboratory facilities for their research. The expenditures from the fund will be used only in prosecution of special problems of research. (*Turn to next page*)

## Anti-Evolution Protest

*General Science*

Protesting against all legislation and administrative interference with the presentation of the facts and theories of science, deploring the anti-evolution laws now on the statute books of three states, the American Association for the Advancement of Science and the American Association of University Professors, the two representative societies of science and education, announced in resolutions a fighting attitude against present and further encroachments upon the freedom of science and teaching.

At the November elections Arkansas passed an anti-evolution law by a large popular vote. Tennessee and Mississippi had previously placed a ban on evolution, and even more powerful in some cases are the unwritten prohibitions that many institutions impose upon teachers with loss of their jobs as the penalty.

This growing menace caused the scientists and educators to emphasize the basic principles of free and untrammeled teaching and plan steps toward a reformation.

The special committee of scientists, empowered with the delegated authority of over 20,000 scientists and over fifty scientific organizations, consisted of Prof. Edwin G. Conklin of Princeton, Prof. S. J. Holmes of the University of (*Turn to next page*)

## Prize Research—*Continued*

extremely sensitive to the action of the beta hormone," Dr. Kamm said in explaining his work. Others readily return to normal after administration of the hormone, and they are the physiological drys.

"The fleshy type of individual is almost invariably of the wet type, whereas the slender, scrawny individual is usually a dry. The suggestion is therefore made that we have here possibly one of the important explanations why the former is fleshy and why the latter fails to put on weight readily in spite of an excessive intake of food and water.

"It is apparent that the portly person who is desirous of reducing must cut down on his liquid intake, as well as on his intake of solid food. As for the scrawny person, gland therapy may possibly be indicated, but here the work is still in the investigative stage and conclusions cannot be drawn."

Since the beta member of the "pituitary twins" affects the body's water content, it may prove useful in the treatment of severe burns which produce their damage by dehydrating the tissues of the body. Diabetes insipidus, characterized by disturbed water conditions of the body, may be better understood and treated through the use of the beta hormone when its cost is reduced to a price much less than its present value of three million dollars a pound.

The post-pituitary hormones are very similar in chemical behavior in spite of their different physiological action. One of the effects that is produced with equal facility by either of them is the increasing of the sugar content of the blood to counteract, for example, an overdose of the hormone, insulin, which science gave the world only a few years ago as a treatment for diabetes mellitus.



## Strange Animals—*Cont'd*

striking animals easily obtainable are not exhibited in the United States on account of the quarantine laws. These animals are practically all hoofed species, inhabitants of regions subject to communicable diseases which must not be brought into the United States because of the great risk of infecting our domestic animals here. A single case of the foot and mouth disease imported by the tiny mouse deer would cause a loss of millions of dollars. From regions in which these diseases occur animals cannot be imported, and so at the present time our collections all lack such specimens as the big-horned gower and the goyal and their small relative the banting (a tiny buffalo of the East Indies), the four-horned deer and the musk deer, the dainty chevrotain of West Africa, and the curious Andean deer.



## Anti-Evolution—*Cont'd*

California. Dr. Henry Fairfield Osborn, president of the American Museum of Natural History; Dr. R. A. Millikan, president of the California Institute of Technology and newly elected president of the American Association for the Advancement of Science, and Dr. J. C. Merriman, president of the Carnegie Institution of Washington.

"We deplore all efforts to restrict the freedom of teaching and learning in science," the resolution stated. "We deplore such action first because evolution in some form is accepted by practically all competent men of science the world over, and second, because the idea of evolution has so profoundly influenced the thinking of mankind in biology, psychology, ethics, social science and philosophy that no one can pretend to have a liberal education who is ignorant of its grounds and import. We deplore these measures also for a deeper reason, which should appeal to all Americans of whatever creed who believe in intellectual and religious liberty whether they accept or reject the theory of evolution, namely, that such restrictions constitute a violation of a fundamental principle of freedom essential to all progress. What is taught as science should be determined by qualified experts in their fields rather than by popular vote."



# The Biology of Fear

*Medicine—Psychiatry*

WILLIAM S. SADLER in *The Truth About Mind Cure* (McClurg):

Fear is biologic. The tendency is inherent. It is easy to implant in the mind of a young child. It grows luxuriantly and flourishes extraordinarily, and if it is not counteracted by the diligent cultivation of faith, comes finally more or less to possess the mind and soul of its victims. If the individual happens to be the possessor of an inherent wobbly nervous system and has not been blessed with mental discipline and nerve training in his younger years, then he is well on the road to becoming a lifelong sufferer from fears, phobias, and other imaginary dangers and delusions.

We know that savage races and primitive peoples are fear-ridden. The Zulus and the Hottentots, as well as other aborigines, are slaves to fear and superstition, and yet, who ever heard of a Hottentot having "nervous exhaustion" or a Zulu being afflicted with "brain-fag"? If these simple people worry so much and are so constantly exercised by fear, why do they not suffer more from "nerves"? The answer is simple. Fear alone will seldom cause a nervous breakdown. The mischief-making combination is fear plus concentration. It is spasm of the attention that does the wicked business.

Before fear can injure your health very much you have to go to school—attend college—and learn the civilized art of a high degree of mental concentration. It is the better educated individual who has mastered art of concentration and who is so unfortunate as to concentrate his well trained mind on a disastrous fear-thought; it is such a combination of fear and continuous concentration that constitutes worry, and worry is nothing more nor less than chronic fear—spasm of the attention.

This is the explanation of why uneducated races and undisciplined minds can indulge in constant fear of all the phenomena of nature and live lives of perpetual anxiety, and yet be strangers to the nervous disorders which afflict the modern civilized races.



## X-Ray Fund—*Cont'd*

The field which the new fund will help to develop was opened up only recently by a number of widely scattered and independent workers, who discovered, almost simultaneously, that pronounced changes can be produced in the hereditary nature of animals by subjecting their reproductive cells to bombardments of powerful radiation. Evolutionary changes of certain types have been speeded up over a thousand per cent. in some of the experiments.

# A National Psychological Laboratory

*Psychology*

Following are further reports on papers in psychology presented at the New York meeting of the American Association for the Advancement of Science.

A national psychological laboratory, somewhat like that famous government laboratory, the U. S. Bureau of Standards, was proposed by Dr. Knight Dunlap, of Johns Hopkins University.

The laboratory would not be under government control, he explained. Its advantages would be that it could undertake programs of research too lengthy, too expensive, and too complicated for the laboratories connected with universities and other institutions.

Dr. Dunlap deplored present conditions in psychological research, which lead to so much isolated and fragmentary knowledge and leave fundamental problems unsolved. Complexity of conditions under which experiments are conducted is one of the present handicaps, he showed. Experiments with a single type of complicated apparatus, such as the galvanometer, which is used in investigations of the emotions, may produce results which no other experimenter can repeat because nobody knows the exact conditions of the experiment. Frequent shifting about of psychologists, each carrying his own pet interests to his new post, makes for inefficiency in the laboratories, since apparatus for hearing experiments bought for the use of one scientist is inherited by another who is interested in studying the formation of animal habits as displayed by innumerable rats put through a maze.

In a national psychology laboratory, truly cooperative results of the highest value could be obtained, Dr. Dunlap said. Scientists working in their own laboratories on details of the big problems undertaken at the national laboratory could arrange to transfer their work there during a year's leave of absence or during the summer vacation. Work done there could be subjected to criticism while in progress, instead of afterwards. Standards of research could be elevated.

### *Personality Growth Measured*

The rate of growth of a boy's personality as he progresses from picture blocks to marbles and then to baseball and to dancing depends more on his physical growth than on his intelligence. This was the report made by Dr. Paul H. Furfey, of the Catholic University of America.

"This means that within a group of boys of a given age, we are more likely to find the larger boys enjoying the same type of activity than we are to find the brighter boys doing so," the psychologist stated.

Dr. Furfey described a test he has designed to measure the stage of development (*Turn to next page*)

# Pollens Tell of Ancient Forests

*Botany*

Following are further reports on papers in botany and allied sciences presented at the New York meeting of the American Association for the Advancement of Science.

A hundred thousand years ago, more or less, when the ice of the great glaciers was retreating slowly to the north, Lake Erie was much larger than it is now. As the climate modified, the lake shrunk, and the newly exposed bottom became forest land, mostly boggy in nature. What those forests were like can be told by studying the miscroscopic pollen grains still to be found in the layers of the buried bogs, and it was a picture of these ancient forests that was presented by Prof. Paul B. Sears and Miss Phyllis Irene Draper, of the University of Oklahoma.

The two botanists have developed a method of identifying pollen grains by microscopic examination, which will tell the kinds of plants they came from almost as accurately as if the investigators were walking through the woods of the early postglacial period. Between the first and second shorelines of the Lake Erie of that early day they found that the forest contained conifer trees at first, but in the course of time was succeeded by a hardwood forest. Within a shoreline representing a more ancient stage of the lake, however, they found that the evergreens had predominated.

### *Regulation Good For Grazing*

Regulated grazing in national forests, the result of scientific research, has resulted in marked improvements in the value of the areas as sources of food, W. R. Chapline of the U. S. Forest Service told members of the American Society of Agronomy.

"The continued prosperity of the range livestock industry depends upon improving and maintaining the range resource which furnishes nearly 70 per cent. of the feed for all live stock in the 11 far western states," said Mr. Chapline. "The productivity of national forest ranges has increased about 25 per cent. in the last 15 to 20 years through regulation and the application of improved principles developed by research. On the other hand most other range areas, including the unregulated public domain, have continued to decline until, on the average, they are at least 50 per cent. below their producing possibilities.

"Improvement in the density and volume of range plants greatly reduces surface runoff and erosion, affords a more stable water flow, and reduces floods and the excessive silting of reservoirs and other damage thereby resulting. On the other hand excessive grazing through the decrease of the density and volume production of range plants, may seriously influence the watershed values of range lands."

### *Best of Corn Leaf Near Tip*

A corn plant can afford to give up half its leaves rather than the outer ends of all of them. The food-making value of the outermost half of the leaf seems to be higher than that of the parts nearer the stalk.

These and other effects of cutting and breaking corn leaves were reported by Prof. George H. Dungan of the University of Illinois.

Prof. Dungan mutilated corn leaves in various ways, and then compared the yields in grain from the stalks. Cutting off the outer or tip half of each blade was much more injurious than the removal of half the number of blades, and slightly more severe than the loss of one side of all the blades. Breaking the midrib of each leaf was more harmful than slitting the blade (*Turn to next page*)

## Psychology at A. A. A. S.—*Continued*

that an individual's personality has reached. We know that the girl who enjoys social dancing is more mature than the girl who plays with dolls, and that the boy who likes basketball is more mature than the boy who prefers tag, he pointed out. The stages of development are usually described in such general terms as the "age of dramatic play", the "questioning age", and the "gang age".

"By use of these terms we recognize the fact that the child, as he grows older, changes not merely in intelligence and bodily size but in his general reaction patterns as well," Dr. Furfey said.

To meet the need of a way to measure the developmental age of the individual, he has worked out a test which shows the stage of the child's play interests, reading interests, and attitudes toward various ideas. When the developmental, or personality, ages of a large number of boys were compared with their mental ages and their physical growth, it was found that high or low intelligence have less to do with the maturity of a boy's interests than his height and weight have.

### *Bad Tempers and Illness*

Persons who have had a greater number of diseases in the course of their lives appear to be more irascible than those who have had fewer diseases, according to Dr. George M. Stratton, of the University of California.

Dr. Stratton described the progress of an investigation in which adults' emotional reactions to certain situations were recorded and then compared with their disease histories from babyhood.

"Persons who have suffered disease in the first five years of their lives appear in general to respond more intensely to anger situations than do persons whose diseases came later," the psychologist stated.

### *Fair Deal for Dull Children*

Children who are mentally dull or backward in their studies should not be left to struggle along through the regular school classes where they become indolent and discouraged, Dr. J. E. W. Wallin, of Miami Unisity, declared.

At present a great many of these children are not sorted out early and given a fair chance to learn as much as they can in special classes, he showed. Out of more than 4,000 cases of deficient children referred to two psycho-educational clinics conducted by Dr. Wallin, about 2,000 were ten years old or even older. In an efficiently organized school system most of these handicapped children would have been examined at six or seven years of age by psychologists and assigned to classes for the mentally deficient or to classes for the backward, according to their needs.

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## Plant Sciences at A. A. A. S.—*Continued*

to the midrib on each side. Injury to the leaves while they were young resulted in a greater decrease in grain yield than corresponding injury inflicted when they were more advanced.

The experiments were conducted with a view to gaining data that might be of use in studying hail injury to the corn crop.

### *Potatoes Need a Mother's Care*

That young potato plants need maternal care and nourishment until they are pretty well along in life was strikingly demonstrated by Dr. F. E. Denny of the Boyce Thompson Institute for Plant Research at Yonkers, N. Y.

In describing his researches, Dr. Denny stated that he had devised a way by which a young potato could be unearthed and deprived of its mother tuber—"seed" potato in ordinary parlance—without disturbing its root system. This operation was performed on potato plants of several strains, at various stages of their development, and the same procedure was gone through with, except for the removal of the mother tuber, on a series of check plants.

All plants deprived of their mother tubers just as their sprouts were emerging, and also plants orphaned when they were only two inches high, yielded smaller crops of tubers than the check plants allowed to keep their mother tubers. Potatoes of the Irish Cobbler variety were apparently almost ready to make their own way in the world when they were ten inches tall, for when the mother tuber was removed at that stage of development their subsequent crops were only slightly reduced. But other varieties of potatoes still showed the effects when the operation was performed as late as this.

### *Diseases Tax Sugar Bowl*

One of the average American's most vulnerable spots, his sweet tooth, is hard hit by various fungous diseases and other germ-caused ills. The sugar-bowl tax levied by fungi, bacteria, protozoa and other life that lurks invisible in the soil or floats in the air was discussed before the meeting of the phytopathologists.

Dry rot canker of sugar beets is very uneven in its exactions on the growers of the West, some years taking heavy toll and others letting them off nearly scot-free. Dr. C. M. Tompkins of the U. S. Department of Agriculture declared that this is because the organism that causes it grows best at a higher temperature, so that in a cool spring the beets get a good start and hold the fungus at a considerable disadvantage. When the early growing weather is warm the fungus catches up with the beets and works havoc.

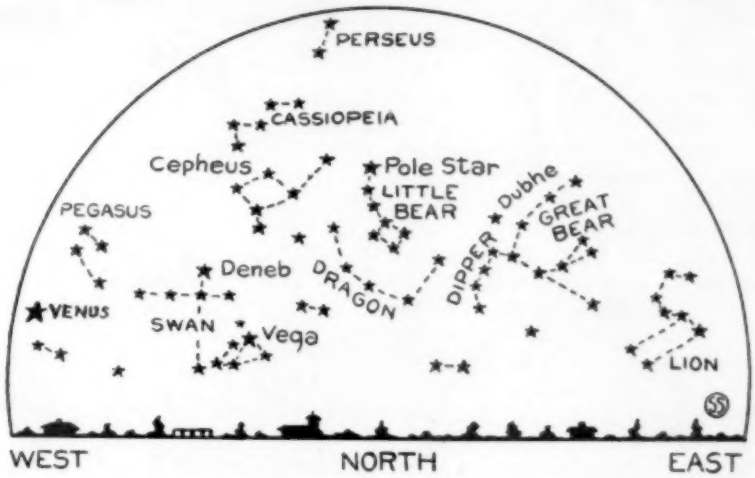
Cooperation with nature was suggested by Dr. Tompkins and his associate S. B. Nuckols as a means for controlling the damping-off disease of sugar-beet seedlings. Beet seedlings always have to be thinned out by hand. The government phytopathologists suggest that this thinning be postponed until the seedlings have reached the six-leaved stage. By this time the disease itself will have thinned out the weaklings and most susceptible plants, and those that survive but are already visibly ill can then be plucked up and discarded also.

Another source of worry was added to the burden of sugar-cane producers when Dr. Melville T. Cook, of the Insular Experiment Station, Porto Rico, reported on some stages in the life history of an organism closely related to the one causing the familiar club-root of cabbage. The sugar-cane parasite lives in the water-conducting vessels of the cane, but unlike the cabbage organism, does not form galls. The microbe travels through the water tubes to a considerable distance in the plant. It is distributed in the seed cuttings and possibly in other ways.

*Science News-Letter, January 12, 1929*

# Eclipse Feature of Astronomical Year

*Astronomy*




By James Stokley

This month marks the inauguration of a year with several important celestial events, chief of which is the best total eclipse of the sun in recent years. Part of the year will see the planet Venus at unusual brilliance. An annular eclipse of no great scientific value, but interesting as a spectacle, will occur. The Leonid meteors next November, should become a little more numerous than they have been in past years. Several comets will return to the neighborhood of the earth, while other new ones, that have never before been seen, will undoubtedly come into view.

The sun eclipse occurs on May 9. As the moon's shadow sweeps across the earth, it will cut a swath over parts of Sumatra, the Malay Peninsula, French Indo-China and the Philippine Islands. As a total eclipse affords astronomers their only opportunity of seeing the corona, the outer layer of the sun, and of making certain other observations, they will travel from all parts of the world to see it. In addition it will be of interest as a spectacle—perhaps the most magnificent that the eye of man can behold. Anyone whose business takes him to this part of the earth should surely arrange to see it.

Many astronomers at this early date have made plans to see this eclipse. It is the most favorable in a number of years and the first that has afforded really good chances of being successful since 1926. In that year, on January 14, there was a total eclipse visible in the same part of the world. Malaysia has been unusually favored with eclipses in recent years, because one was also seen in Sumatra on May 18, 1901. The one of 1926 started in Africa, passed north of Madagascar, across the Indian Ocean, Sumatra, Borneo and Mindanao.

In the eclipse next May the shadow of the moon first touches the earth south of Madagascar, then it crosses the Indian Ocean to northern Sumatra, the Malay Peninsula, the southern tip of French Indo-China, and a number of the Philippine Islands, including Lawan, Panay, Negros, Cebu and Leyte.

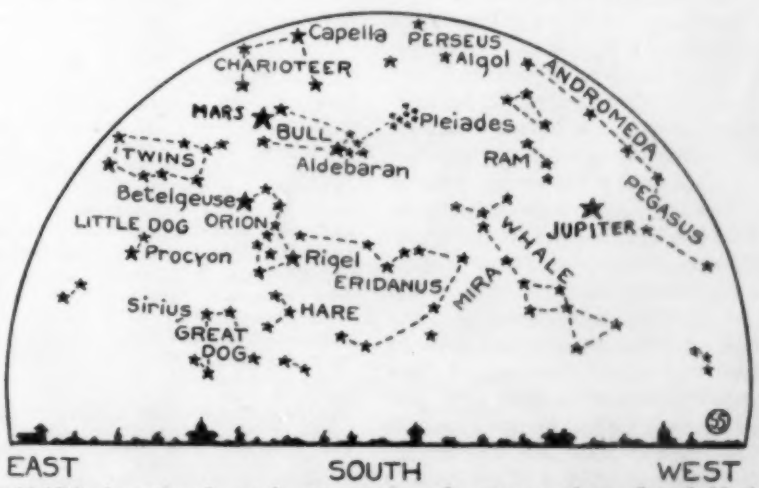
It is impossible for an eclipse at any one place to last for more than 7 minutes and 40 seconds. Usually it is much less. While this year's eclipse is not as favorable as that of 1901, which lasted six minutes, it is much better than the one of 1927 in England, or the one of 1925 in New England. The coming eclipse will last about five minutes in Sumatra and nearly four minutes in the Philippines.

Although the weather outlook is not perfect, there is more than an even chance of clear skies. The astronomer can predict the exact time of an eclipse years in advance but the weather is more fickle than the heavenly bodies. The specialist must take his chances with the clouds on the same basis as the ordinary layman. When he travels half way around the world to observe an eclipse, however, he chooses the place with the best record of clear weather.

In order to provide astronomers intending to visit the Philippines with meteorological information, Rev. Miguel Selga, S.J., head of the Weather Bureau in the Islands, has made a special study of conditions along the path of the eclipse. This shows that conditions are fairly good at Iloilo, on the Island of Panay. The conditions seem somewhat better at Cebu, but the town is farther from the center of the path, and the eclipse is briefer.

After this year there is not an eclipse in the Philippines until 1955. Although over seven minutes in duration, it occurs on June 20, during the rainy season, when there is little clear weather.

The eclipse this May will not be visible at all in the continental United States. Americans must be content with some of the less striking, but none the less interesting, astronomical happenings. During February and March, Venus will be high in the western evening sky, and will be brighter than it has been for many years. It will be (*Turn to next page*)




*THESE MAPS show the sky as it appears these January evenings. Just hold them in front of you as you face north or south, and the upper or lower will represent the stars you see on a clear night*

## January Star Story—*Continued*

half way from the horizon to the zenith at sunset, and will be conspicuous throughout the evenings. In fact, it will be bright enough to cast a shadow of its own on a dark night, for the only regular heavenly inhabitants that exceed it in brightness, when it is at its brightest, are the sun and moon.

The year's second eclipse will occur on November 1, visible from Africa. This eclipse will be "annular", not total. The entire edge of the sun will be visible as a luminous ring around the dark moon. Interesting as it will be to watch, such an eclipse lacks the spectacular features of a total eclipse, such as the appearance of the corona, and is of little scientific value.

This should be a good year for meteors, especially next November. On the nights of the 14th and 15th the earth enters the swarm of Leonids, so called because when we see them they seem to emerge from the constellation of Leo. At intervals of 33 years these meteors become especially numerous. The last maximum occurred in 1899 and 1900, so that we are within a few years of the next. This November should bring a better display than we have had for several years.

Another meteor shower that the year will bring forth will be the Perseids, on August 11 and 12. The Andromedes come on November 20 and 23, but are not as numerous as the Perseids.

Comets also should be coming along. The year 1928 was rather disappointing in this respect. Nine comet discoveries were credited to 1927, and the two years previous were also quite fruitful in this respect. During 1928, only three were found, and two of these dated from the beginning of the year. One was found by a German, Reinmuth, the second by a Frenchman, Giacobini, and the third by a South African, Forbes. Three times during the year comets were reported, but all of these were later discovered to be due to errors. One such report proved to be really a photographic defect on a plate, while another was an asteroid, or tiny planet.

Metcalf's comet, found in 1906 by the late Rev. Joel Metcalf, a New England Unitarian minister who was also an accomplished astronomer, is expected back in 1929. So is Daniel's comet, found in 1909. Two comets that had been expected in 1928, Holmes' and Encke's, had not yet been found in November, and probably were lost. Metcalf's comet has not been seen again since the year of its discovery, and neither has Daniel's, so they cannot be counted on. But there is always the possibility that a really bright comet may turn up unexpectedly, like the first one in 1910. Not since then has the earth seen a really first-rate comet.

The maps show the principal stars in the sky in January. Sirius is the brightest of them all. In the south is the familiar group of Orion, with the three stars forming the warrior's belt. Below the belt is Rigel, and above is the reddish Betelgeuse. Procyon, in Canis Minor, the little Dog, is not far from Sirius. Capella, in Auriga, the Charioteer, is nearly overhead. In the southern sky, in Taurus, the Bull, is red Aldebaran, Eastward, in the sickle of Leo, is Regulus.

Mars, the red planet, is also in the constellation of Taurus. It need not be confused with Aldebaran, however, for the planet is considerably the brighter of the two, and its light is more steady than that of the twinkling star. Jupiter is shining brilliantly in the southeast. Lower down in the same quarter of the sky is Venus, not so bright as Jupiter just now; although she will soon surpass him.

*Science News-Letter, January 12, 1929*

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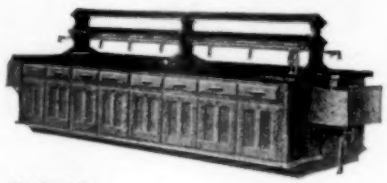

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# Television At Stage of 1921 Radio

*Seismology*

"Television is not a vague and remote project, but, while still experimental, is an imminent and plausible probability. Indeed, a fair parallel is to compare television in its present state of development with ordinary broadcasting in its condition in 1921."

Such is the opinion of Dr. Alfred N. Goldsmith, chief broadcast enengineers of the Radio Corporation of America, expressed to Science Service. For a considerable time the engineers of the Radio Corporation have been making confidential experiments with television, looking forward to the time when it will be as common as broadcast music or speech. These experiments have been under Dr. Goldsmith's direction. So far has this development gone that it will be ready for the public within a few years.

"Radio television is at a stage when it is prepared to leave the seclusion of the research laboratory and enter into the daily affairs and uses of man," he said. "Intensive development work of an experimental nature has already been carried on and transmission of television material is at hand through confidential experiments and transmissions carried on at Schenectady, Pittsburgh and New York."

As Dr. Goldsmith foresees it, three types of service will be rendered by television broadcasting, each of which will require its own band of wavelengths. One is the urban service that will be rendered to "lookers-in," as he calls the television audience, in large cities. Here the problem of absorption by buildings or radio waves carrying the images must be considered.

"A certain band of wavelengths or frequencies is believed to be suitable for television in such districts," he said, "and will be first experimentally tested for the purpose and later utilized on a systematic service basis."

The second class of television service is that for suburban and rural lookers-in. These people, he said, will have a new means of contact with people outside their normal range of travel. As these areas are much larger and cover a different sort of terrain, another band of wavelengths will be required for their most effective use, he believes.

Finally, there is international television. As this will have to be for great distances, frequently across oceans, a third group of wavelengths will be needed.

Dr. Goldsmith also explained why a frequency band of 100 kilocycles width is needed for television, while one of 10 kilocycles will suffice for effective broadcasting.

"The width of channel in television broadcasting (expressed in kilocycles) determines the field of view of the picture and also its clarity or fineness of detail," he stated. "For example, a narrow band of frequencies assigned to television would permit the transmission only of unpleasantly crude images of restricted dimensions, and would therefore at once block the development and public appreciation of this new art. Even the 100-kilocycle bands which have been recommended are capable of giving only a picture of moderate dimensions and of fairly acceptable sharpness and clarity."

The possibilities of television broadcasting are almost without limit.

"When one considers the number of important forms of television programs which could be sent to the broadcast listeners-in and lookers-in, one is compelled to curb one's imagination," he declared. "Everything that the drama can afford, that the musical comedy has to offer, that the debating stage can provide, that the concert stage can furnish, that the motion picture has given to humanity, can be brought into the home with synchronized sound as a complete source of thoroughly satisfying and highly interesting human entertainment, instruction and edification."

That the Government should be especially careful of its regulation of television is the belief of Dr. Goldsmith.

"The wise policy of the Government which encouraged the development of broadcasting in 1921, if similarly applied to television at the present time, will lead to a tremendous and desirable growth of that art as a service to the public," he said.

Dr. Goldsmith believes that the Government should confine its television licenses to experienced and responsible organizations, such as the Radio Corporation of America, for, he said, "only such organizations can be depended upon to uphold high ideals of service. 'Television,' so-called, from irresponsible sources, will benefit only the oculists of the United States in proportion as it ruins the eyesight of the public 'lookers-in.'"



## Nature Ramblings

By Frank Thone

*Natural History*

*Calla Lily*

An old favorite of our grandmothers is coming back into popularity again, both as a houseplant and as a cut flower. This is the calla lily, whose waxy white sheaths may be seen in any florist's windows nowadays, sometimes companioned by a cousin calla in golden yellow. They are really attractive plants, and with good care will do much to help dwellers in winter-bound cities to wait in patience for the return of spring.

The calla lily is not really a lily. The true lilies have flowers shaped like those of the Easter lily and the tiger lily, with the floral envelope divided evenly into six pointed parts, and with six stamens and a single pistil arranged within them. The calla lily, as a matter of fact is not strictly speaking a flower at all. It is a whole stalk of flowers, and the wide, sheathing petal-like thing around it is a modified protective leaf. Technically that kind of a floral object is called a spathe. The stiff stalk standing up inside is known to botanists as a spadix, and its surface, if examined closely with a good magnifying glass, will be seen to be crowded with innumerable little objects that are the real flowers.

This device of the calla's, of crowding a host of tiny flowers along a stalk and surrounding that with a spathe, is used by a great family of plants, ranging through temperate and tropical regions all over the world. Familiar in our own springtime woods is the Jack-in-the-pulpit, and almost as common is the green dragon. The dasheen, introduced a few years ago into the South as a food crop, is a cousin of the calla lily. And the great, broad-leaved "elephant ears" used in the more pretentious lawn and park plantings, is another relative of this lovely wax-flowered ornamental.

# Maize Finders, Ancient and Anonymous

*Agriculture*

PAUL DE KRUIF, in *Hunger Fighters* (Knopf):

What fighters of hunger can compare to the unknown finders of the American maize?

Of all green living things maize is the chief trapper of the energy of the sun's rays. Eaten as corn and bread, and turned into four-legged beasts and their milk, made into two-legged fowl and their eggs, maize is the principal food of the people of the western continents.

What sort of man or woman first found this maize? Wondrous lusty: it shoots from a seed to the size of a tree in less than three months. Tough is this Indian corn: it sends out new leaves after spring frosts and laughs at the cold nights of October. Resourceful: it yields three hundredfold on the soggy lands along the lower Mississippi—and it sends down long tap roots to hunt and find moisture in the southwest lands where there is no rain.

What brown-faced genius with straight black hair first learned to guard the maize? For of all green things this strong helper of man is the weakest: the Indian corn plant is more dependent on man than the most absurd poodle. A thousand times more domestic is the maize than the most helpless goldfish: without endless storing, hoeing, reaping, saving, and sowing by men, this plant would die out—utterly. Unlike wheat, unlike any food giving life to men, there is no wild maize: none has ever been known to escape the hands of men to grow free. It can't grow free. With heavy kernels tight on a cob and enclosed by enormous husks, no wind that blows can scattter the seed of it broadcast; untended by man, the young plants—though so vigorous—are killed off by grass in a jiffy.

But who first knew all that? What kind of prophet with what strange insight was this first aboriginal American with high cheekbones who first felt the absolute need to save the maize, to store it, always to hoe it, knowing he must sow it again—knowing it would never rise by itself again through some kind quirk of God or trick of nature? . . .

From what wild plant could this Indian corn have come? Today there are fifty colleges where savants with their heads full of big-named facts about maize study the chemistry of its life-stuff, the mathematics of its breeding. But never a one of them can breed corn from any wild plant—not even from the tasseled Mexican grass, teosinte. "To be wild," smiles Guy Collins, corn historian, slouched in his chair and sucking at his pipe, "any parent of the maize would have to be very unlike the maize itself!" So it's silly to search for the wild parent now. And it's foolish to guess the time of the birth and the finding of the maize—in Peru there exist fossilized ears of corn untold thousands of years old; from Iowa there are stories of ears of maize that have left their record in slate deposits deep underground. Yet, in some misty month when the world was young, a wild green plant changed suddenly into this delicate food plant that would surely have died out—left to itself. Or, for some months, or years, or hundreds of years, two unknown wild green tasseled grasses married and begat and conceived fantastic children that themselves were enormously fertile—but as helpless to survive as so many abandoned human babies. . . . In those mysterious days a man—or was it a woman?—happened by, a clod of a man, with a dirty face. It was an epic accident.

Who will ever know the language of that man's scientific report of the finding of the maize? Was it written? Or did he tell it in a mumble of low-pitched growls and a jumble of high-pitched grunts to a college of his mates held in the warmth of that new invention—fire? Or is maize older than tame fire?

Heaven knows how many thoustands of years afterwards—after straight-haired Americans had nursed the flame of the seed of it all those thousands of years—new immigrant Americans, civilized white men, scrambled out of their boats on to the coast of eastern America—and took the maize. There was nothing scientific about their discovery but it was only a matter of their empty stomachs turning somersaults. It was the first bleak Massachusetts autumn for those Puritan white men: the going was hard. Then Miles Standish and his scouts, in despair how to fill their bellies, came upon fields of an outlandish new kind of grass tall as a tree. They stumbled over mounds, dug into them; looking over their shoulders in fear of possible owners, they pulled out of the ground a little old basket filled with Indian corn. "We dug further," wrote their scribe, "and found a fine great new basket of very fair corn of that year—six and thirty goodly ears of corn, some yellow, some red, others mixed with blue, a very goodly sight."

Guarded by their flintlocks, they filled an old kettle with it, stuffed their wide pockets full of it, put it in their great hats, and Miles Standish and his God-fearing men scampered off with it believing it better to ask the Indians whether or no they might have it—afterwards. They were hungry. "And surely it was God's providence that we found this corn," wrote the recorder of the deeds of those pious Pilgrims, "for else we know not how we should have done. . . ."

*Science News-Letter, January 12, 1929*

## The Camel's Hump

*Education*

M. S. DUDGEON in *Adult Education and the Library*, for July 1928:

The old theory of education has been termed the camel's hump process. Before starting on our journey of life, our minds were filled with knowledge, much as the camel fills his hump, and the supply was expected to endure and nourish us all the days of our life; as we went through the years we might become thinner and weaker intellectually, but we staggered on without any later sustenance or education

*Science News-Letter, January 12, 1929*

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Australia's population averages a little more than two people per square mile.

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In India last year there were 1,033 men killed by tigers, and 1,068 tigers were killed by men.

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A tortoise can live to be 350 years old, but no elephant has been known to live beyond 130 years.

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So little ancient Greek jewelry has been discovered that the idea has been advanced that the Greek tombs may have been systematically raided centuries ago by thieves.

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London's great epidemics of plague in the seventeenth century took off the poor; the wealthy and influential left the city, leaving the poor people unemployed and uncared for.

# FIRST GLANCES AT NEW BOOKS

THE PHYSIOLOGY OF SEXUALITY IN ANIMALS—F. A. E. Crew—*Macmillan* ($4). It required a certain amount of courage to get up a book on the physiology of sexuality, because new data accumulate so rapidly as to endanger its uptodatedness almost on the day of its publication. But physiologists and experimental morphologists will be grateful to the author for getting a survey of the field into so compact and easily referable a form, and especially for the extensive bibliographies that follow each section.

*Physiology*
*Science News-Letter, January 12, 1929*

ZOOLOGY OF COLORADO—T. D. A. Cockerell—*Univ. of Colorado* ($2). This is one of a series celebrating the semicentennial of the founding of the University of Colorado. In this volume are presented in concise form the outstanding systematic and ecological facts about the principal vertebrate animals of the state, together with briefer treatment of some of the more frequently encountered invertebrates.

*Zoology*
*Science News-Letter, January 12, 1929*

ANIMAL ECOLOGY—Royal N. Chapman—*Burgess-Roseberry Co.* ($6). This is a mimeographed book, but none the less one of the most ambitious volumes on its subject that has yet appeared. The author, a well-known entomologist, draws upon insects for a considerable part of his illustrative data, though mammals, birds and aquatic animals are not neglected. The treatment is thoroughgoing, and there are many graphs and maps. The bibliographies are especially noteworthy for their completeness.

*Ecology*
*Science News-Letter, January 12, 1929*

DESTRUCTIVE AND USEFUL INSECTS—C. L. Metcalf and W. P. Flint—*McGraw Hill* ($3.50). As nearly as it can be done, the whole range of entomology has been crowded into the 900-odd pages of this volume. As might be expected in present-day America, the economic entomology approach dominates the book, though not to the damage of a genuinely scientific outlook or completeness of treatment. Typographically and mechanically the volume gives evidence that the publishers appreciated the work of the authors.

*Entomology*
*Science News-Letter, January 12, 1929*

EXPERIMENTS IN HEAT — Joseph Grant Brown—*Stanford University Press* ($1.50). One of the physics series in the Stanford Laboratory Guide, intended for use with a four or five-unit college course in heat extending over a period of twelve weeks.

*Physics*
*Science News-Letter, January 12, 1929*

THE PREHISTORY OF AVIATION—Berthold Laufer — *Field Museum.* Aeronautics dates back to the ancient days of China, India, Babylon, Persia, and air mail began with the pigeons of the Orient. This is an interesting booklet on the age-old hopes and attempts of man to fly.

*Anthropology—Aeronautics*
*Science News-Letter, January 12, 1929*

FUNDS AVAILABLE IN THE UNITED STATES FOR THE SUPPORT AND ENCOURAGEMENT OF RESEARCH IN SCIENCE AND ITS TECHNOLOGIES—Callie Hull and C. J. West—*National Research Council* ($1). This should be the guide to those who have ideas and little money or those who have money and are in doubt as to how to spend it effectively. It reveals the extent and support of American research.

*General Science*
*Science News-Letter, January 12, 1929*

ENGINEERS OF YESTERDAY—Peter A. Brannon—*Paragon Press, Montgomery, Ala.* This booklet tells the story of the early surveyors and builders of the state of Alabama.

*Engineering*
*Science News-Letter, January 12, 1929*

INDUSTRY, GOVERNMENTS AND LABOR—International Labor Organization—*World Peace Foundation* ($2). The most important work of the League of Nations has been its sponsorship of the health, labor and other essentially non-political organizations that have used the Geneva organization as a nucleus to tie to. This is the ten-year record of international labor.

*Economics*
*Science News-Letter, January 12, 1929*

REPRESENTATIVE SPECIFICATIONS FOR DIFFERENT USES OF SAND AND GRAVEL—*National Sand and Gravel Association* (Free). Little grains of sand are the basis of an extensive industry. Millions of tons are used each year and this pamphlet gives the qualifications necessary for sand and gravel to enter concrete, roads, filters and foundries.

*Engineering*
*Science News-Letter, January 12, 1929*

TREES AS GOOD CITIZENS—C. L. Pack—*Amer. Tree Assn.* ($2). A new printing of a well-known and useful book about trees for street, highway, park and home planting. The book tells what trees are best for each purpose, something about the virtues of each species, and how to protect them from enemies and unfavorable environment.

*Dendrology*
*Science News-Letter, January 12, 1929*

OUTDOORS ADVENTURES — A. E. Shirling—*World Book Co.* ($1). A nature reader for school children, well written and illustrated much better than books of its kind usually are.

*Nature Study*
*Science News-Letter, January 12, 1929*

BEGINNING TO GARDEN — Helen Page Wodell—*Macmillan* ($1.75). A well planned and well illustrated little book for youngsters who are undertaking their first adventures in making things grow. Excellently adapted for school use.

*Horticulture*
*Science News-Letter, January 12, 1929*

THE AMPHIBIANS OF WESTERN NORTH AMERICA—J. R. Slevin—*Calif. Acad. of Sciences* ($3). A monograph of the amphibians of the Pacific slope from Alaska to Sonora and Lower California, including also those of the Great Basin states.

*Zoology*
*Science News-Letter, January 12, 1929*

THE COMPARATIVE PHYSIOLOGY OF INTERNAL SECRETION—Lancelot T. Hogben—*Macmillan* ($4). The present knowledge of the physiology of the endocrine glands is here presented in compact form. Since the book covers the subject thoroughly and critically, it will be of especial value for reference purposes. It is quite beyond the scope of the lay reader.

*Endocrinology*
*Science News-Letter, January 12, 1929*

BIOLOGICAL CHEMISTRY AND PHYSICS OF SEA WATER—H. W. Harvey—*Macmillan* ($4.25). We are always at a disadvantage in our study of marine organisms, because they live in sea water and we live in air and fresh water, and therefore find it hard to think in terms of the natural environment of shark and starfish and seaweed. The author of this book qualifies as a good interpreter between that world and ours.

*Chemistry—Physics*
*Science News-Letter, January 12, 1929*

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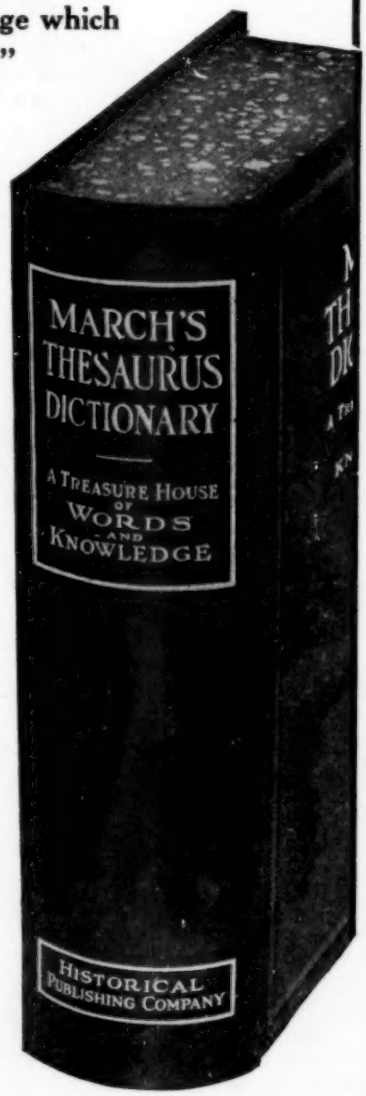


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# CLASSICS OF SCIENCE:

## Canals on Mars

*Astronomy*

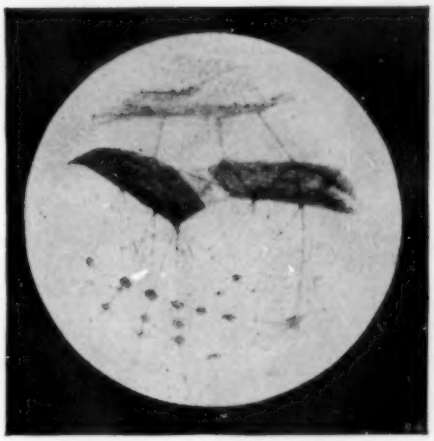
With this issue, the SCIENCE NEWS-LETTER inaugurates a series of Classics of Science in Astronomy, which will appear the first of each month, in the number with the Star Map, giving the most interesting observations on each of the planets in our solar system. A few years ago, the canals on Mars might have been classed by many astronomers as pure fiction. It is now felt that they represent real markings on the surface of our nearest planetary neighbor. Their origin must ever be a most fascinating speculation. There follows one eminent astronomer's exposition of his side of that famous controversy which furnished our literature with one of its outstanding characters, "the Man from Mars."

*MARS, by Percival Lowell. Boston,* 1895.

### *First Appearances*

In the last chapter we saw how badly off for water Mars, to all appearance, is; so badly off that inhabitants of that other world would have to irrigate to live. As to the actual presence there of such folk, the broad physical characteristics of the planet express no opinion beyond the silence of consent, but they have something very vital to say about the conditions under which alone their life could be led. They show that these conditions must be such that in the Martian mind there would be one question perpetually paramount to all the local labor, women's suffrage, and Eastern questions put together—the water question. How to procure water enough to support life would be the great communal problem of the day.

Were Mars like the Earth, we might well despair of detecting signs of any Martians for some time yet. Across the gulf of space that separates us from Mars, an area thirty miles wide would just be perceptible as a dot. It would, in such case, be hopeless to look for evidence of folk. Anything like London or New York, or even Chicago in its own estimation, would be too small to be seen, so sorry a figure does man cut upon the Earth he thinks to own. From the standpoint of forty millions of miles distance, probably the only sign of his presence here would be such semi-artificialities as the great grain-fields of the West when their geometric patches turned with the changing seasons from ochre to green, and then from green to gold. By his crops we should know him. A tell-tale fact this, for it would be still more likely to be the case with Mars. If the surface of the planet were cultivated at all, it would probably be upon a much more thorough plan than is the case with the Earth. Conditions hold there which would necessitate a much more artificial state of things. If cultivation there



*CANALS ON MARS, from a drawing by Dr. Lowell. The long, straight line, known as the Titan, shows near the center of the disk.*

be, it must be cultivation largely dependent upon a system of irrigation, and therefore much more systematic than any we have as yet been forced to adopt.

Now, at this point in our investigation, when the broad features of Mars disclose conditions which imply irrigation as their organic corollary, we are suddenly confronted on the planet's face with phenomena so startlingly suggestive of this very thing as to seem its uncanny presentment. Indeed, so amazingly lifelike is their appearance that, had we possessed our present knowledge of the planet's physical condition before, we might almost have predicted what we see as criterion of the presence of living beings. What confronts us is this:—

When the great continental areas, the reddish-ochre portions of the disk, are attentively examined in sufficiently steady air, their desert-like ground is seen to be traversed by a network of fine, straight, dark lines. The lines start from points on the coast of the blue-green regions, commonly well-marked bays, and proceed directly to what seem centers in the middle of the continent, since most surprisingly they meet there other lines that have come to the same spot with apparently a like determinate intent. And this state of things is not confined to any one part of the planet, but takes place all over the reddish-ochre regions.

The lines appear either absolutely straight from one end to the other, or curved in an equally uniform manner. There is nothing haphazard in the look of any of them. Plotting upon a globe betrays them to be arcs of great circles almost invariably, even the few outstanding exceptions seeming to be but polygonal combinations of the same. Their most instantly conspicuous characteristic is this hopeless lack of happy irregularity. They are, each and all, direct to a degree.

The lines are as fine as they are straight. As a rule, they are of scarcely any perceptible breadth, seeming on the average to be less than a Martian degree, or about thirty miles wide. They differ slightly among themselves, some being a little broader than this; some a trifle finer, possibly not above fifteen miles across. Their length, not their breadth, renders them visible; for though at such a distance we could not distinguish a dot less than thirty miles in diameter, we could see a line of much less breadth, because of its length. Speaking generally, however, the lines are all of comparable width. . . .

### *A Network of Lines*

But, singular as each line looks to be by itself, it is the systematic network of the whole that is most amazing. Each line not only goes with wonderful directness from one point to another, but at this latter spot it contrives to meet, exactly, another line which has come with like directness from quite a different direction. Nor do two only manage thus to rendezvous. Three, four, five, and even seven will similarly fall in on the same spot,—a gregariousness which, to a greater or less extent, finds effective possibility all over the surface of the planet. The disk is simply a network of such intersections. Sometimes a canal goes only from one intersection to another; more commonly it starts with right of continuation, and, after reaching the first rendezvous, goes on in unchanged course to several more.

The result is that the whole of the great reddish-ochre portions of the planet is cut up into a series of spherical triangles of all possible sizes and shapes. What their number may be lies quite beyond the possibility of count at present; for the better our own air, the more of them are visible. About four times as many as are down (*Turn to next page*)

## Canals on Mars—*Continued*

on Schiaparelli's chart of the same regions have been seen at Flagstaff. But, before proceeding further with a description of these Martian phenomena, the history of their discovery deserves to be sketched here, since it is as strange as the canals themselves.

### *History of the Canals*

The first hint the world had of their existence was when Schiaparelli saw some of the lines in 1877, now eighteen years ago. The world, however, was anything but prepared for the revelation, and, when he announced what he had seen, promptly proceeded to disbelieve him. Schiaparelli had the misfortune to be ahead of his times, and the yet greater misfortune to remain so; for not only did no one else see the lines at that opposition, but no one else succeeded in doing so at subsequent ones. For many years fate allowed Schiaparelli to have them all to himself, a confidence he amply repaid. While others doubted, he went from discovery to discovery. What he had seen in 1877 was not so very startling in view of what he afterward saw. His first observations might well have been of simple estuaries, long natural creeks running up into the continents, and even cutting them in two. His later observations were too peculiar to be explained, even by so improbable a configuration of the Martian surface. In 1879 the *canali*, as he called them (channels, or canals, the word may be translated, and it is in the latter sense that he now regards them), showed straighter and narrower than they had in 1877: this not in consequence of any change in them, but from his own improved faculty of detection; for what the eye has once seen it can always see better a second time. As he gazed they appeared straighter, and he made out more. Lastly, toward the end of the year, he observed one evening what struck even him as a most startling phenomenon,—the twinning of one of the canals: two parallel canals suddenly showed where but a single one had showed before. The paralleling was so perfect that he suspected optical illusion. He could, however, discover none by changing his telescopes or eye-pieces. The phenomenon, apparently, was real.

At the next opposition he looked to see if by chance he should mark a repetition of the strange event, and went, as he tells us, from surprise to surprise; for one after another of his canals proceeded startlingly to become two, until some twenty of them had thus doubled. This capped the climax to his own wonderment, and, it is needless to add, to other people's incredulity; for nobody else had yet succeeded in seeing the canals at all, let alone seeing them double. Undeterred by the general skepticism, he confirmed at each fresh opposition his previous discoveries, which, in view of the fact that no one else did, tended in astronomical circles to an opposite result.

For nine years he labored thus alone, having his visions all to himself. It was not till 1886 that any one but he saw the canals. In April of that year Perrotin, at Nice, first did so. The occasion was the setting up of the great Nice glass of twenty-nine inches aperture. In spite of the great size of the glass, however, a first attempt resulted in nothing but failure. So, later, did a second, and Perrotin was on the point of abandoning the search for good, when, on the 15th of the month, he suddenly detected one of the canals, the Phison. His assistant, M. Thollon, saw it immediately afterward. After this they managed to make out several others, some single, some double, substantially as Schiaparelli had drawn them; the slight discrepancies between their observations and his being in point of fact the best of confirmations.

Since then, other observers have contrived to detect the canals, the list of the successful increasing at each opposition, although even now their number might almost be told on one's hands and feet.

### *Steady Air Essential*

The reason that so few astronomers have as yet succeeded in seeing these lines is to be found in our own atmosphere. That in ordinary atmosphere the lines are not easy objects is certain. A moderately good air is essential to their detection; and unfortunately the location of most of our observatories preclude this prerequisite. Size of aperture of the telescope used is a very secondary matter. That Schiaparelli discovered the canals with an 8 1-3 inch glass, and that the 26-inch glass at Washington has refused to show them to this day, are facts that speak emphatically on the point. . . .

Next in importance to a steady air comes attentive perception on the part of the observer. The steadiest air we can find is in a state of almost constant fluctuation. In consequence, revelations of detail come only to those who patiently watch for the few good moments among the many poor. Nor do I believe even average air to be entirely without such happy exceptions to a general blur. In these brief moments perseverance will show the canals as faint streaks. To see them as they are, however, an atmosphere possessing moments of really distinct vision is imperative. For the canals to come out in all their fineness and geometrical precision, the air must be steady enough to show the markings on the planet's disk with the clear-cut character of a steel engraving. No one who has not seen the planet thus can pass upon the character of these lines.

**Percival Lowell** was born in Boston in 1855, and died November 12, 1916, at Flagstaff, Arizona. He was graduated from Harvard at the age of 21. After extensive travels, including about ten years in Japan, he established the Lowell Observatory at Flagstaff in 1894 and edited its "Annals."

**Mars** is the fourth planet from the sun, its orbit lying next outside that of the earth. It is frequently visible as a brilliant reddish planet, which may be seen high in the sky. Its mean distance from the sun is a little more than one and one-half times that of the earth. Its average distance from the earth is 48,600,000 miles. The Martian year is nearly twice the length of ours, but the length of the day there is almost exactly the same as on the earth. Mars has an atmosphere containing oxygen and water vapor. The sky is blue and occasionally cloudy. The surface has no rugged mountains. There are large desert areas. There are also large areas where vegetation appears in the spring, expands as the days grow warmer, withers in the fall, and disappears in the winter. This vegetation must be hardier than ours, however, for the temperature during the day is about 50 degrees Fahrenheit, and at night drops below the freezing point. Polar caps expand during the winter and retreat in summer. The one at the south pole frequently disappears in summer, but the northern one is permanent. One explanation of the markings known as canals on the surface of the planet is that they carry water from the melting snow-caps to the other parts of its land. Two moons of Mars, discovered for earth-dwellers in 1877 by Dr. Hall of the U. S. Naval Observatory, revolve around the planet. The outer one, Deimes, appears to the Martians as a brilliant planet. The inner one, Phobos, ten miles in diameter, looks to them more as our moon looks to us, although apparently only about one-third as large, with the strange exception that it rises in the west and sets in the east.